REMARKS

Claims 1-5 are currently pending. Claim 1 is the only independent claim.

In the Office Action, the Examiner:

rejected claims 1-5 under 35 USC § 103(a) as being unpatentable over Murphy et al. (US 6,352,662) in view of Blackinton, Jr. et al. (US 6,299,810).

The present invention solves the problem of irregularities (i.e. pits and dimples) formed on the surface of an internal pressure molded part due to air remaining in the space between the external forming die and the surface of the pre-preg part (specification, page 3). According to the present invention, a composite body, which includes a holding tube and a prepreg, is inserted into a vacuum chamber, which contains an unclamped forming die. The forming die and the composite body (the prepreg and the internal-pressure holding tube) are positioned in the vacuum chamber in a manner that the composite body and the forming die do not contact each other. The vacuum chamber is evacuated with the composite body and the forming die not contacting each other. After completion of the evacuation of the vacuum chamber, the forming die is clamped such that the forming die and the composite body now contact each other.

Claim 1, which is directed to a method for forming a hollow FRP article by internal pressure molding, recites, in part:

inserting a composite body including said internal-pressure holding tube and said prepreg into a vacuum chamber containing a forming die,

evacuating said vacuum chamber in an isolation state where said composite body and said forming die do not contact each other, and

clamping said forming die to bring said forming die and said composite body into contact with each other and heating said forming die with an application of pressure to an inside of said internal-pressure holding tube after completion of said evacuation step.

With respect to the rejection of claim 1 as being unpatentable over Murphy in view of Blackinton, the Examiner asserts that Murphy discloses wrapping a mandrel with a bladder and fiber-reinforced plies and placing the wrapped mandrel in a

mold. According to the Examiner, Murphy fails to teach applying a vacuum such that the fiber-reinforced plies do not contact the mold. The Examiner cites to Blackinton to provide for drawing a vacuum onto said vacuum bag and said vacuum chamber such that the bag is kept off the fibers (composite body and forming die do not contact each other). Thus, according to the Examiner, it would have been obvious to provide a vacuum bag and a chamber to thereby apply a vacuum such that the bag is kept off the fibers as taught by Blackinton in the process of Murphy because Blackinton specifically teaches such a process allows for the removal or air bubbles from within the pre-preg material, hence providing for reduced porosity and as such, providing for an improved product."

Applicants respectfully submit that the combination of Murphy and Blackinton fail to teach each and every element. Specifically, as the Examiner recognizes, Murphy fails to disclose evacuating said vacuum chamber in an isolation state where said composite body and said forming die do not contact each other, as required by claim 1. And, contrary to the Examiner's assertion, Blackinton also fails to disclose evacuating said vacuum chamber in an isolation state where said composite body and said forming die do not contact each other.

Murphy discloses wrapping a mandrel with a bladder and a plurality of pre-preg plies, placing the wrapped assembly within, and into contact with, a mold and pressurizing the pre-preg plies outward against the mold by introducing a pressurized gas through the mandrel. (See Murphy, col. 3, ll. 5-25; col. 5, ll. 32-35; FIG. 1). Murphy fails to disclose applying a vacuum. Murphy fails to disclose a vacuum chamber. Murphy discloses that the pre-preg plies contact the mold when the wrapped assembly is placed inside the mold.

Blackinton discloses a process for vacuuming and compressing a carbon fiber weave or sample to form a solid plank or board, wherein in one embodiment a carbon fiber weave is wound about a mandrel and the mandrel is thereafter applied within a vacuum bag. (Abstract; col. 4, lines 40-41; col. 19, lines 6-14.) The mandrel is sealed within the vacuum bag and placed within a vacuum chamber, wherein a vacuum is drawn both on the vacuum chamber and the vacuum bag causing the vacuum bag "to float above the carbon weave or sample so that as air is drawn from the weave, the bag is kept off the weave." (Col. 4, lines 51-54; col. 19, lines 26-34.)

The vacuum in the chamber is then reduced "so that there is a pressure differential between the chamber and the bag, causing the bag to compress tightly about the carbon fiber weave so as to apply a pressure thereto." (Col. 4, lines 61-65; col. 19, lines 41-49.)

Blackinton further discloses mandrel 25 sealed within a vacuum bag 400 and then placed within a vacuum chamber 407. (Col. 19, lines 26-27; FIG. 8B.) Although not numbered, FIG. 8B expressly provides for a tray in the vacuum chamber to support the mandrel sealed within a vacuum bag. Thus, the vacuum bag 400 necessarily contacts the weave 15 at the tray/bag interface.

Blackinton states that drawing a vacuum on both the chamber and the vacuum bag causes the vacuum bag "to float above the carbon weave or sample so that as air is drawn from the weave, the bag is kept off the weave." Applicants submit that this statement does not mean that carbon weave and vacuum bag do not contact each other over the entire surface of the composite body. Applicants specifically refer to Blackinton's FIG. 8B, which shows the bagged, fiber-wrapped mandrel resting on a platform or tray (unnumbered) within the vacuum chamber and note that there is no teaching in Blackinton that the bagged, fiber-wrapped mandrel does not rest on this platform. Thus, Applicants submit that a person of ordinary skill in the art, upon considering Blackinton's disclosure that the vacuum bag "floats above" the sample would understand this disclosure to merely teach that the vacuum bag is not compressed tightly against the sample during evacuation of the bag. In other words, Blackinton teaches that the bagged, fiber-wrapped mandrel rests on a platform within the vacuum chamber and that pulling a vacuum on both the chamber and the bag allows the air within the bag to be more easily evacuated because the bag is not tightly compressed around the mandrel. A person of ordinary skill in the art would recognized that the reference in Blackinton to the vacuum bag floating above the carbon weave or the bag being kept off the weave, while possibly being descriptive of the area of the fiber-wrapped mandrel facing upward, is not describing of the area of the fiber-wrapped mandrel resting on the platform. Applicants submit that the disclosure of a "floating bag" does not teach that the fiber-wrapped mandrel does not rest on a platform, and thus, Applicants submit that this disclosure does not teach that there is no contact. At most Blackinton's "floating

bag" disclosure teaches that there would be negligible contact or, possibly, lack of contact between the bag and the sample only at the top surface of the sample.

Thus, Applicants submit that neither Murphy nor Blackinton, either alone or in combination, teaches, suggests or motivates "an isolation state where said composite body and said forming die do not contact each other," as required by claim 1.

Further, Applicants submit that there is no motivation to provide the vacuum bag and chamber as taught by Blackinton in the process of Murphy. First, if the vacuum bag/vacuum chamber of Blackinton were to be combined with the mold of Murphy, such that the vacuum bag is placed either within the mold or around the mold of Murphy, the mold of Murphy would still contact the plies of the composite body when the composite body is place within Murphy's mold. Alternatively, if the solid, relatively rigid, mold of Murphy were to be replaced with the flexible vacuum bag of Blackinton, Murphy would be rendered inoperable, or at the very least, Murphy teaches away from such a replacement. Murphy teaches the internal pressurization of the composite body, away from the mandrel and against the rigid mold, during the curing step. This teaching of internal pressurization against a rigid mold is incompatible with the use of a flexible vacuum bag as taught by Blackinton. At the very least, Blackinton's flexible vacuum bag could not replace the rigid mold of Murphy as it does not provide the molded profile of the finished part as is required by Murphy of its mold. Further, Applicants submit that Blackinton's flexible vacuum bag cannot be considered to be a forming die, as required by claim 1. Thus, Applicants respectfully submit that there is no motivation to combine Blackinton with Murphy such that the solid mold of Murphy is replaced with the flexible vacuum bag of Blackinton, or alternatively, that each and every element of claim 1 is not disclosed by the combination of Blackinton with Murphy should the solid mold of Murphy be replaced with the flexible vacuum bag of Blackinton.

Still further, claim 1 recites heating the forming die. Applicants submit that the combination of the references cited by the Examiner fails to disclose this limitation. Even if, *arguendo*, Blackinton's vacuum bag could be equated with a forming die and could replace Murphy's mold as the Examiner suggests, neither

Blackinton nor Murphy teach heating a vacuum bag. Thus, the combination fails to teach each and every element of the claim.

Finally, Applicants submit that, even assuming *arguendo* all the elements of the present invention are found in a combination of the cited prior art references (which Applicants dispute above), the prior art teaches away from the claimed invention. Murphy discloses that a bladder is inflated by introducing gas through the mandrel 50 and/or directly into the bladder, which forces plies 60, 62 of pre-preg against the wall 72 of the mold 70, that is heated to a predetermined temperature, for a time sufficient to allow the resin in the plies 60 to fully cure. (Col. 5, lines 44-51.) In contrast, Blackinton expressly provides that first there is a rise in temperature of the carbon fiber weave "that would indicate the start of curing of the resin material." (Col. 19, lines 37-40.) Further, thereafter the vacuum in the vacuum chamber is reduced and the pressure in the chamber is increased "so that there is a pressure differential between the chamber and the bag, causing the bag to compress tightly about the carbon fiber weave so as to apply a pressure thereto. At the same time, the heating elements within the mandrel are actuated so that the carbon fiber weave is heated as pressure is applied." (Col. 4, lines 61-65; col. 19, lines 41-49.)

One of ordinary skill in the art would have had to (1) ignore the teaching of Murphy wherein a bladder is inflated to a predetermined internal pressure by gas through a mandrel and/or directly into the bladder to force plies of pre-preg against a wall of a mold, or ignore the teaching of Blackinton to create an external pressure differential between a chamber and a bag, causing the bag to compress tightly about a carbon fiber weave so as to apply a pressure thereto; (2) ignore the teaching of Murphy to force plies against the wall of the mold that is heated to a predetermined temperature, or ignore the teaching of Blackinton to actuate heating elements within the mandrel so that the carbon fiber weave is internally heated as external pressure is applied; or (3) ignore the teaching of Murphy to start curing upon contact of the piles with the pre-heated mold, or ignore the requirement of Blackinton that there be a rise in temperature of the weave sufficient to indicate the start of curing first, prior to the application of pressure. Thus, one of ordinary skill in the art would not have provided a vacuum bag as taught by Blackinton to the process of Murphy.

Finally, even assuming *arguendo* there was a motivation to combine the cited prior art references, Applicants submit the prior art would not have revealed that in so carrying out the combination, those of ordinary skill would have a reasonable expectation of success in light of the stark differences identified above in the references. In fact, it is difficult for Applicants to conceive a reasonable expectation of success based on the cited references themselves, without undue experimentation. Thus, the cited references teach away from their combination such that one of ordinary skill in the art would not have provided a vacuum bag as taught by Blackinton to the process of Murphy.

Since all of the limitations of Applicants' claim 1 are not taught or suggested by the combination of Murphy and Blackinton, claim 1 is not obvious under 35 USC § 103(a) over this combination. Accordingly, the rejection of claim 1 under 35 USC § 103(a) should be withdrawn.

Claims 2-5 depend either directly or indirectly from claim 1, and also recite additional limitations. Thus, for at least the above-identified reasons, dependent claims 2-5 are also not obvious over the combinations of cited references addressed above. Therefore, the rejection of claims 2-5 under 35 USC § 103(a) should also be withdrawn.

Applicants believe that no fees are due in connection with filing this Response. However authorization is hereby given to charge Deposit Account No. 13-0235 in the event any such fees are owed.

Respectfully submitted,

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